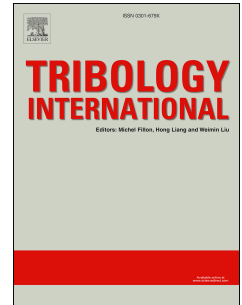


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Development and Validation of an Integrated Planetary Gear Set Permanent Magnet Electric Motor Power Loss Model

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Abstract

This study proposes a methodology to predict power losses of traction motor having an integrated planetary gear set permanent magnet electric motor, including both load-dependent and load-independent power loss components. The methodology combines a planetary gear set loss model which accounts for sliding and rolling losses at the external and internal gear mesh contact interfaces, a bearing mechanical and drag loss model, a gear drag loss model, an external and internal gear mesh pocketing loss model, a permanent magnet synchronous machine iron, and copper loss model. Power loss measurements from a developed prototype traction motor having integrated planetary gear set permanent magnet electric motor is compared to model predictions to successfully demonstrate the accuracy of the proposed methodology.

Keywords: Integrated gear drive, Load-dependent power loss, Load-independent power loss, permanent magnet electric motor power loss

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